U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS—MILTON WHITNEY, Chief.

SOIL SURVEY OF RAPIDES PARISH, LOUISIANA.

BY

E. H. SMIES, IN CHARGE, RISDEN T. ALLEN, J. B. R. DICKEY,
W. A. ROCKIE, R. C. JURNEY, R. R. BURN,
M. EARL CARR, AND HUGH H. BENNETT.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1916.]

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., June 15, 1917.

SIR: In the extension of the soil survey in the State of Louisiana, work was undertaken in Rapides Parish and completed during the field season of 1916.

The accompanying report and map cover this survey and are submitted for publication as advance sheets of Field Operations of the Bureau of Soils for 1916, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. D. F. HOUSTON,
Secretary of Agriculture.

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MAP.

Soil map, Rapides Parish sheet, Louisiana.

SOIL SURVEY OF RAPIDES PARISH, LOUISIANA.[1]

By E. H. SMIES, In Charge, RISDEN T. ALLEN, J. B. R. DICKEY, W. A. ROCKIE, R. C. JURNEY, R. R. BURN, M. EARL CARR, and HUGH H. BENNETT.—Area Inspected by HUGH H. BENNETT.

DESCRIPTION OF THE AREA.

Rapides Parish is situated in central Louisiana on the Red River. It is bordered on the north by Grant Parish, on the east by La Salle and Avoyelles Parishes, on the south by Evangeline and Allen Parishes, on the west by Vernon Parish, and on the northwest by Natchitoches Parish. Alexandria, the parish seat, is 193 miles northwest of New Orleans. The parish comprises an area of 1,353 square miles, or 865,920 acres.

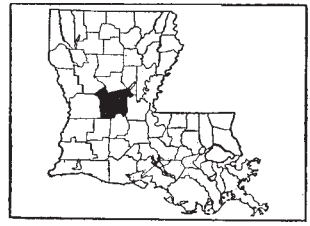


FIG. 1.—Sketch map showing location of the Rapides Parish area, Louisiana.

The topography of the uplands varies from level and undulating to gently rolling and rolling. The most rolling country occurs in a belt extending from the vicinity of Woodworth and east of this town to the northwestern parish line, especially along Bayou Boeuf and in the vicinity of Libuse and Tioga, to the north of the Red River. Even here there are few slopes too steep to cultivate. Undulating to level land, flat except for occasional dome-shaped mounds, is quite well distributed throughout the parish, increasing in extent toward the south. That part of the parish south of Glenmora is mainly level or undulating. There are no very conspicuous hills or ridges in the parish.

The first-bottom lands and terraces or second bottoms are mainly level, but locally there are depressions, such as the abandoned channels of streams, and faint elevations or swells, especially on the sandy soils. On the terraces there are quite a few dome-shaped mounds,

[1] The field work of this project was in charge of Mr. E. H. Smies, and the greater part of the area was surveyed by him. The report was written by Messrs. Bennett and Dickey.

which give some areas a billowy surface, and in places some slight ridges and hillocks modify the topography.

The elevation above sea level at the union railroad station at Alexandria, in the Red River bottoms, is 77 feet. The highest part of the uplands lies probably not more than 75 to 150 feet above this elevation.

With the exception of the level areas, the parish is traversed by many streams and small tributaries, and the drainage of the uplands is prevailingly good or at least fair. The level areas and some of the more gently undulating tracts, especially in the southern part of the parish, have not been so thoroughly invaded by drainage ways, and most of the watercourses here are merely shallow depressions. The drainage is, therefore, more or less imperfect. The smaller streams frequently become dry in the summer. All the permanent streams have moderately swift currents, but they are not actively deepening their channels.

All the first-bottom lands are subject to rather deep and frequent inundations, and some of the lower terraces are overflowed at times of exceptionally high water. Overflows are most frequent in the spring, but may occur at any time of the year, and cotton, corn, sugar cane, and other common crops are liable to serious damage where not protected by levees. Hay and pasturage crops, such as Bermuda grass and lespedeza, can be grown in places in the bottoms. The Red River has been leveed, and farming in the bottom lands of this stream is carried on safely, although there are some low, swampy areas which are inundated under present conditions and thus rendered uncultivable. These low areas probably will be reclaimed eventually by means of ditches and flood gates through the levees.

The total population of Rapides Parish in 1910, according to the census, was 33,332. Three-fourths of the population is classed as rural, but this includes several thousand persons living in the small towns outside Alexandria. About two-thirds of the rural population consists of white persons. The total population, however, includes 48 per cent of negroes, residing largely in Alexandria and the small towns. There are few negro farmers in the uplands. Most of the whites are descendants of the early settlers. Some are of French and Spanish extraction. In recent years Bohemians, Hollanders, and Belgians have settled in the Red River bottoms and about Libuse.

Alexandria, with a population in 1910 of 11,213, is the largest city in the parish. Other important towns are Boyce, Lecompte, and Cheneyville, with populations ranging from 500 to 1,000, and Glenmora, with about 110 inhabitants.

The greater part of the parish has good transportation facilities. Freight boats ply the Red River throughout the parish. Railroad

lines radiate from Alexandria in all directions, affording splendid communication with all parts of the State. There are a number of logging roads in the northern, eastern, and southern parts of the parish, some of which may eventually develop into permanent railways.

In general the parish is well supplied with dirt roads, and those in the uplands are fairly good throughout the year. The Red River bottom roads are good in the summer, but become very sticky and difficult to travel in winter, especially on certain clay soils. Highway improvement is being carried on by the parish. Good road beds are easily constructed with the sand-clay material everywhere accessible in the uplands.

Alexandria is the principal market for the farm products of the parish, but cotton and other staple crops can be marketed at all the railroad towns. There is good railroad communication with the markets of New Orleans on the south, and Memphis, Little Rock, and St. Louis on the north.

CLIMATE.

The climate of the region in which Rapides Parish is situated is characterized by long, warm summers and short, mild winters, with an abundant rainfall.

The summer temperatures range from a maximum of 109° F. to a minimum of 45°, the mean being 81.3° F. Hot weather usually begins about the last of April or early in May and continues until October. The winter season has a mean temperature of about 50° F. A maximum of 87° and a minimum of 3° have been registered. The summer heat is often, especially at night, tempered by gentle winds, while warm periods are common in the winter.

The rainfall has ranged from about 78 inches in the wettest year to about 42 inches in the driest. The annual mean is 54.9 inches. The precipitation is well distributed throughout the year. The months of least rainfall are September and October. A very small proportion of the precipitation occurs in the form of snow.

The average date of the last killing frost in the spring is March 8, and that of the first in the fall November 10. The normal growing season is thus 247 days in length. The latest killing frost in the spring recorded at the Alexandria station occurred April 9, and the earliest in the fall October 14.

The following table, compiled from the records of the Weather Bureau station at Alexandria, gives the more important climatic data:

Normal monthly, seasonal, and annual temperature and precipitation at Alexandria.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
December	49.5	85	10	5.07	0.92	3.92	0.7
January	49.3	87	16	4.79	5.81	5.90	.1
February	50.3	85	3	5.79	1.04	8.96	.7
Winter	49.7	87	3	15.65	7.77	18.78	1.5
March	60.2	93	20	5.23	3.86	8.49	0
April	66.9	93	29	4.37	2.20	14.21	0
May	73.6	99	39	4.63	1.19	6.63	0
Spring	66.9	99	20	14.23	7.25	29.33	0
June	79.7	106	45	5.24	14.58	8.43	0
July	82.0	109	59	5.72	6.74	9.71	0
August	82.1	107	48	4.17	.75	2.40	0
Summer	81.3	109	45	15.13	22.07	20.54	0
September	77.3	102	40	2.86	.33	1.91	0
October	66.2	98	28	2.86	.17	2.74	0
November	57.7	88	19	4.17	4.84	5.12	0
Fall	67.1	102	19	9.89	5.34	9.77	0
Year	66.2	109	3	54.90	42.43	78.42	1.5

AGRICULTURE.

Farming early became the principal interest of the settlers in Rapides Parish. The principal crops grown at first were cotton and corn. Some cattle and hogs were raised on the range for home use and for marketing. The first lands taken up were in the Red River bottoms, on the prairies in the northeastern part of the parish, and in the uplands near some of the larger streams. The early settlers became possessed of large tracts under Spanish grants. Until the time of the Civil War the plantations were large and prosperous, some of them embracing thousands of acres. The financial demoralization following the war resulted in the abandonment of much cultivated land and the renting of much more on shares to negro tenants, who grew cotton almost exclusively. With returning prosperity negro tenancy decreased somewhat, but agriculture suffered two more severe setbacks in the coming of the boll weevil and in the big flood of 1908.

For more than 50 years a large part of the Red River bottom land has been under cultivation, and the farmed acreage here increased considerably following the construction of the levees. More than 75 per cent of the upland has never been cultivated. There are some old settlements in the uplands, but these are rather widely scattered. The uplands were largely occupied by a heavy growth of longleaf pine, yielding in many places as much as twenty or twenty-five thousand board feet of lumber per acre. Within the last ten or fifteen years lumbering has become an important industry. A large part of the upland has been cut over, and cutting is continuing at a very rapid rate. Before lumbering began turpentining had been carried on for a number of years in the southern and western parts of the parish, many trees being worked directly ahead of the woodcutters. Large cut-over areas throughout the uplands have not been settled, and the cut-over area is being added to rapidly.

The present type of agriculture in Rapides Parish consists of the production of sugar cane for the manufacture of sugar and molasses, either alone or in conjunction with cotton and corn production, or it consists of growing cotton as the principal product, combined with the production of corn and raising beef cattle and hogs. The table below shows the acreage and production of the principal crops for the last four census years:

Acreage and production of principal crops.

Census year.	Cotton.		Corn.		Sugar cane.			Hay.	
	Acres.	Bales.	Acres.	Bushels.	Acres.	Sugar.	Molasses and sirup.	Acres.	Tons.
						Pounds.	*Gallons.*		
1880.....	25,622	17,990	29,366	488,370	1,875	1,832,000	134,531	1,060	1,375
1890.....	37,172	25,759	27,484	441,534	2,286	2,978,400	182,524	1,800	2,730
1900.....	46,880	39,162	37,655	821,120	1,729	2,984,825	159,230	4,072	4,894
1910.....	15,420	5,470	39,526	817,569	7,452	(1)	313,600	8,755	15,249

[1] Not reported by census.

At the present time the sugar-cane crop compares well in value with cotton, whose acreage and yield have been greatly reduced on account of the boll weevil. At the present time, however, the production of cotton is increasing. The growing of sugar cane for the manufacture of sugar is confined to the Red River bottoms. Cotton growing is still carried on in the bottoms, but it is more important in the uplands.

Cotton is the most important money crop of the parish. It is grown to some extent on nearly every farm, and on some is the prin-

cipal crop. In the Red River bottoms cotton occupies a prominent place in almost all the rotations where these are practiced. Before the advent of the boll weevil yields of 1 bale or more per acre were common on the bottom-land soils, even with poor cultural methods and without rotation or fertilization. When the weevil first became prevalent cotton growing seemed doomed, but in recent years the growing of early varieties and the practice of better cultural methods have enabled the planters to make a substantial profit at average prices. The weevil is most destructive to the late-maturing crop, and the most successsful varieties are those which set their fruit to a great extent early in August. Some of the most popular varieties are Kings Improved, Simpkins, Mortgage Lifter, and Half-and-Half.

The production of sugar has been an important interest in Rapides Parish since the beginning of agricultural development. Until about 1880 or 1890 each plantation had its own sugar mill where the sirup was evaporated by the open-kettle method. With the advent of improved machinery the old methods became unprofitable and sugar manufacture has been consolidated into two large modern mills. The larger of these, situated at Meeker, has a daily capacity of 1,200 tons of cane. Its 2,000-horsepower plant derives about 65 per cent of its power from bagasse or crushed cane used as fuel. All the cane used for sugar making is grown south of Alexandria on large plantations along the Texas & Pacific Railway, the cane being hauled to the mill on cars. A large plant at Clio Mill, on Bayou Rapides, makes sirup only. Sirup manufacture is quite an important activity on farms both in the pine hills and in places in the river bottoms. The farmers grind the cane in a roll mill and boil down the juice in open kettles. The product is said to be of a higher quality than that manufactured by the larger mills, and it is all disposed of in the local trade at about 50 cents a gallon. The yield is said to vary from 200 gallons an acre on the hill land to 400 gallons on the bottom-land (Miller) soils.

Corn is grown both in the uplands and in the bottoms. The bulk of the corn produced is fed to work stock, beef cattle, and hogs, or made into meal. The production of corn has steadily increased, and at the present time probably more than 40,000 acres are devoted to this crop.

Oats are a common crop on both the bottom and the upland soils. The fields are usually small. The favorite varieties grown are the Louisiana Rustproof and Texas Rustproof. Seeding continues from September until February; the early fall seeding gives much higher yields and in addition furnishes much excellent winter pasturage. Oats are grown mainly for feeding to work stock in the sheaf.

The production of hay has increased considerably in recent years, especially in the case of alfalfa, Bermuda grass, and lespedeza. Hay

is grown mainly on the bottom lands of the Red River, and a very large part of the crop is marketed. Alfalfa in 1899 occupied 937 acres, and in 1909, 1,452 acres. It is grown in many fields on the Miller clay, yielding 3 to 4 tons or more an acre in five or six cuttings. Alfalfa land is grazed to a large extent in winter and spring by beef cattle and hogs. In the Red River bottoms some difficulty is encountered in getting a stand of alfalfa, on account of the growth of Bermuda grass. Bermuda-grass hay is harvested mainly in the Red River bottoms in the northwestern part of the parish. Two or three cuttings can usually be made, the first generally containing much white clover and having a high feeding value. The yields average only a little over one-half ton per acre. The hay is often gathered from the swath with buckrakes, and is either stacked or baled at once. The price obtained is generally about $12 a ton. A large area of bottom land throughout the county not now used or used only for pasture could advantageously be given over to the production of several valuable hay crops. White clover is a desirable pasture crop that is being encouraged, especially on the Miller soils. Some hay is cut on the prairies in the northeastern part of the parish. This consists largely of broom sedge, which makes fairly good feed for cattle if cut early. The abandoned fields in the post-oak lands east of the prairies are gradually growing up to lespedeza or Japan clover, which is cut in August and makes a hay of excellent quality. The yields are rather light.

A small acreage of cowpeas is harvested for hay. This legume is frequently sown after a crop of oats. Yields sometimes reach 2 tons per acre and the hay is highly regarded, although rather hard to cure. The Clay is the favorite variety sown for hay, while for seed production the Whippoorwill is more desirable, being earlier and bearing more heavily. The seed is picked by hand, and as much as 20 bushels per acre is sometimes obtained.

Soy beans have given good results in Rapides Parish. On one farm on the Miller very fine sandy loam the Mammoth Yellow variety has yielded nearly 30 bushels of seed per acre, in addition to about 1 ton per acre of hay of high quality. The crop was planted in drills 3 feet apart, following oats. Harvesting took place in September.

Irish potatoes have become an important crop in recent years, especially on the Miller very fine sandy loam in the vicinity of Alexandria, Boyce, and Cheneyville. Sixty carload lots were shipped from the latter place in 1915 despite the unfavorable seasonal conditions. The common commercial variety of potato grown is the Triumph, a small red potato of poor quality. All the seed used is obtained from northern markets.

Sweet potatoes are grown on most farms for home consumption, and an increasing number of carload shipments are made annually,

principally to Texas and northwestern markets. The most commonly grown varieties are the Dooley and Ware Yams, which are yellow skinned and of very fine quality. Some red varieties of potatoes, said to be of superior flavor, also are grown.

Market gardening is carried on by Belgians and Hollanders in the vicinity of Alexandria and some of the other towns in the Red River bottoms. These farmers employ intensive methods and obtain good yields. Bohemian farmers in the vicinity of Libuse grow strawberries of excellent quality for sale on the Alexandria market.

The raising of live stock has always been of more or less importance, especially in the hills and along the borders of the large swamps. Only three parishes in the State exceed Rapides in the number of cattle raised. The census reports the total number in the parish in 1910 as 28,775. Some beef cattle and hogs are raised in the Red River bottoms, but stock farming is relatively less important here than in parts of the uplands, where beef cattle and hogs constitute the principal source of income. Cattle are pastured the year round, although the necessity of feeding some hay in winter is now quite generally recognized. In the rolling pine hills the pasturage consists chiefly of wire grass, which is burned over in February and March. The growth comes up tender and green, and the cattle rapidly put on flesh for several months, until with dry weather the grass becomes hard and less nutritious. Many of the cattle get their summer feed in the swamps, where there is a wealth of clovers, especially white clover, and other grasses which last until December. Feed then becomes scarce, and Spanish moss and other coarse forage are the chief dependence of strictly range cattle. Where lumbering is in progress the stock keeps in excellent condition on moss alone. During hard winters and when long-continued high water prevents pasturing in the swamps the cattle become very poor, and many animals die unless there is an ample supply of hay.

In the prairie section of the parish large herds of cattle are kept. Broom-sedge hay is put up for winter use. This feed is too coarse for horses unless the growth is cut while very young, but it serves to carry cattle through the winter. Japan clover comes up in the old fields on the post-oak lands and affords excellent pasturage. In the river valley the pastures are much better than in the hills, as white clover and other clovers grow luxuriantly in the spring and are supplemented by Bermuda grass and crab grass. In districts where considerable areas are under cultivation the cattle are allowed to forage in the cotton and corn fields after the crops are harvested and cover crops afford considerable subsistence. The large swampy areas furnish abundant summer range, and Bermuda-grass hay and other forage crops can readily be put up for winter use.

Cattle raising offers good opportunities in Rapides Parish. The cattle tick has been one of the greatest drawbacks to stock raising. In the summer of 1915 a number of dipping vats were put in use in various places in the hills section and the river bottoms by the parish government. Dipping is not compulsory [1] and is not yet very common, but the farmers realize its value. With eradication of the tick the stock shipped will command better markets and improved stock will be introduced. There are some bulls of Hereford and Durham blood in the parish, but most of the animals are small. The stock sold is bought by local butchers or small shippers.

Only enough dairy stock is kept in Rapides Parish to supply the local demand. Dairy cows are high in price. Much condensed milk is used for table and cooking purposes. The dairy stock is largely of Jersey blood and includes some excellent animals, although in general the cows are grades. Dairying offers exceptionally good opportunities for farms in the vicinity of Alexandria.

Hogs rank next in importance to cattle, the number on farms in 1910 amounting to 57,247. Rapides Parish ranks fourth in the State in the number of hogs kept. Along the Black Bayou Swamp large numbers of hogs are raised annually on the open range. The animals fatten on acorns, which are very abundant and are said to produce a pork little inferior to that produced on corn, although there is some discrimination in price unless corn is fed in finishing. These hogs are raised at practically no expense, but the rate of increase is estimated at only about 200 per cent, owing to losses from cholera, worms, and other causes. The animals wander far into the swamps and many are drowned by floods; there is generally much difficulty in rounding up the others. In the Red River bottoms the hogs kept are better cared for, generally being run on clover and alfalfa pasturage and fed. Allowing the animals to forage on crops of corn, peanuts, sweet potatoes, and cowpeas in the field has proved profitable. The hogs raised in the " hills " section are of nondescript breeding and extreme bacon type, but there are many well-bred specimens of Berkshire, Duroc Jersey, and Poland China breeds on farms in the valley. Cholera and worms are a serious menace to hog raising, as sanitary precautions are seldom observed. Most of the hogs go to local markets, some being dressed on the farm. Shipments are occasionally made to Dallas and Fort Worth, Tex., by local buyers, but the price paid the farmer is generally low.

Sheep of nondescript breeding are kept in small flocks in both the hills section and the bottom areas. The prevalence of cocklebur on the bottom lands seriously lowers the value of the wool. The 1910 census reports 9,989 head of sheep in the parish.

[1] Since this was written dipping has been made compulsory throughout the State.

The mules used as draft stock on the sugar plantations are of large size and good quality. Almost all the stock is shipped in from Texas. Many colts are raised, but the breeding stock is small and inferior. Generally the mares used are too small and the colts are not well enough fed and cared for. The opportunities in mule raising are excellent.

Poultry is the source of considerable farm income, the total revenue in 1909 amounting to $74,353. The 1910 census reports 91,981 fowls in the parish. Beekeeping is important in parts of the parish, especially in the river bottoms. The census reports the number of colonies of bees in 1910 as 859. The long blooming season of white clover, which is extremely abundant, provides excellent pasturage.

Owing to the natural adaptation of the soil and topography in the Red River bottoms to sugar cane and alfalfa, the production of these crops has been centered in this part of the parish. Farmers have shown considerable recognition of crop adaptation in the use of the soils here. The sandy and silty soils are mainly used for sugar cane, partly for the reason that they give good yields and partly because the crop can be cut and handled better than on the clay soil, which becomes very sticky and difficult to travel over when wet. In the uplands not much attention is given to soil adaptation, aside from the fact that the lower lying and moist areas are sometimes chosen for corn and sugar cane, cotton being grown more generally on the better drained, higher lying sandy soils. The Miller very fine sandy loam has been selected by a few truckers for the production of Irish potatoes. Well-drained sandy soils are preferred for sweet potatoes.

In the uplands cotton and corn are grown on ridges, thrown up usually with a 1-horse turning plow. Plowing generally is done a short time before planting and, as a rule, the furrow is only 3 to 4 inches deep. These crops are given rather frequent cultivations with a shallow-running 1-horse plow. The grass growth in the row is removed with hand hoes.

In the bottoms cotton generally follows corn or cane and cowpeas. After the stalks have been broken down the land is generally flat broken and later thrown up in ridges on which the seed is planted. Planting takes place between April 1 and April 20. Some of the more successful farmers plant on a low ridge. It is reported that where the cotton plants are left thick in the drill they mature earlier and consequently suffer less damage from the weevil. Although not a common practice, the planting of cotton in April between rows of Irish potatoes has given satisfactory results, the potatoes being harvested about the first of June without disturbing the cotton.

On the best farms cotton is plowed 6 or 7 times on the sandier soils and hoed 3 or 4 times. The customary practice is to "bar the cotton off" at the first cultivation and subsequently to throw earth toward

the ridge by cultivation between the rows. Although in some cases riding cultivators of the disk and shovel type are used to advantage in the Red River bottoms, as well as 1-horse spring-tooth cultivators, by far the greater part of the cultivation is done with 1-horse turning plows and shovels. Cotton is "laid by" in early August, and picking begins in September. On the Miller soils cotton yields from one-half to two-thirds bale per acre, though yields of 1 bale are easily possible with careful tillage. On the upland soils, even where 100 to 200 pounds of fertilizer is used per acre, yields seldom exceed one-half bale.

Intensive methods are employed in the Red River bottoms by the sugar-cane growers. The land is prepared with 4-horse turning plows and disks. Plowing is generally about 6 to 8 inches deep, but somewhat shallower in case of the clay soils. Applications of cottonseed meal, at the rate of about 300 to 500 pounds an acre, are generally made in the spring for the second and third year cane crop; that is, the stubble growth. In some cases heavier applications are made. Many farmers grow cane for three years continuously on the Miller sandy loam and silt loam soils, following the crop with cotton or corn.

Sugar cane is grown on the best drained land, generally on the lighter soils. One of the requisites is good surface drainage. This is accomplished on most plantations by dissecting the land with ditches several feet deep into "cuts" or rectangles 500 feet or more square. Sugar cane is the first crop to be planted in the spring, being put in during February. The land is well broken, and the seed cane, kept over in banked-up beds from the preceding crop, is laid in furrows. Two stalks are laid together, lapping the next two, and so on. The rows are covered with a plow, leaving a ridge about 8 or 10 inches high. From 3 to 4 tons of cane are required to plant an acre. Cultivation with plows and cultivators is given regularly until about midsummer, when the crop is "laid by" and left until cutting begins, usually about October 15. The stalks are cut close to the ground, and the blades and as much of the top as is green are trimmed off. The stalks are then loaded onto tram cars by means of a derrick. Cutting generally lasts until January 1, but severe freezes that occasionally occur split the cane, and the fermentation that at once sets in makes it worthless.

Seed or plant cane (the first crop after planting) ordinarily yields 20 to 40 tons per acre. The second-year, or ratoon, crop, grown from the stubble, yields, on the average, about 15 tons an acre, while the yield the third year is ordinarily 10 or 12 tons per acre. The roots are then plowed out by means of a heavy 4-horse wheeled plow with a rolling colter, which splits the ridges. The land is cropped to corn or cotton for a few years before being returned to sugar cane.

The sucrose content of the cane ranges from 10 per cent to as much as 26 per cent, the content being higher in dry seasons. The average analysis is 11 or 12 per cent, and on this basis 1 ton of cane will yield 150 pounds of sugar, with 5 gallons of molasses as a by-product. The price paid for cane generally depends on the sucrose test.

It is stated that excellent silage can be made from the tops and blades of the cane, which now are allowed to go to waste and in many cases are burned to permit tillage the following spring. The tonnage of this material would be about one-third that of the cane yield.

Corn is cultivated in about the same way as cotton, but not so intensively, and many farmers plant it on the poorer land. On the bottom soils corn is said to average about 20 to 25 bushels per acre, although under good farming methods 10 to 15 bushels more is easily possible without fertilization in favorable years, and yields of over 50 bushels have been obtained by the application of cottonseed meal. On the hill soils yields generally fall below 20 bushels, unless the land is treated with manure or with 100 to 200 pounds or more of fertilizer per acre, when as much as 25 bushels is sometimes obtained. Calhoun and Georgia Red Cob, both white varieties, are commonly grown, as well as Hastings Prolific. An earlier variety of corn is also grown on the bottom soils, to follow some early crop such as potatoes or oats.

Corn rows are commonly spaced 5 feet apart and the stalks placed at intervals of 2 to 2½ feet. Corn is generally planted in March or even late in February. Early and medium-early corn is generally planted on ridges for the sake of drainage, while the late crop is often planted in furrows. Level planting and cultivation have given good results in years when the season was not too wet and the grass not too hard to control. Corn is commonly hoed twice and cultivated 2, 3, or 4 times. When the crop is laid by, usually in May or June, it is a practice to sow broadcast about 3 pecks of cowpea seed per acre. Corn ripens in August but is not generally harvested until September. Ordinarily the ears are snapped off, and in storing the husk is left on as a protection against the weevil. The blades also are sometimes stripped off, bound into small bundles, and stored for winter forage; this practice is often followed in the uplands, but generally the cattle are allowed to clean up the stalk fields. Considerable damage is done to cribbed corn by the weevil. Hard varieties of corn are more immune, but fumigation in the crib is the only sure means of control.

On one field of more than 100 acres on the Miller very fine sandy loam, in 1915, corn was planted with a check rower and cultivated both ways. The season was dry but the crop was quite satisfactory, being disposed of in the field at good prices. The prevailing opin-

ion, however, seems to be that in a wet or even normal season the method of planting and cultivation generally employed in the section gives a better control of weeds, especially the grass.

Oats generally follow cotton in the rotation. The crop is usually broadcasted on roughly prepared land. The crop ripens the latter part of May, the time depending somewhat on how closely and late it is pastured. Harvesting is done largely by hand, and only on some of the larger plantations are oats thrashed. The yield is said to range from 25 to 50 bushels per acre, and the quality is generally good.

Irish potatoes are planted as soon as the ground is dry enough, usually in February and March. In growing this crop cottonseed meal is used as fertilizer, generally in amounts of 100 to 300 pounds per acre. The crop is ridged up in rows 5 feet apart, with the plants spaced 18 to 24 inches apart in the row. Cultivation is given at fairly frequent intervals. The crop is harvested late in May; yields range from 50 to 100 bushels per acre, averaging nearer the former figure. Prices obtained range from 50 cents to $1 a bushel, averaging about 75 cents. The bulk of the crop goes to northern markets. A second crop of potatoes can easily be grown on the same land, but generally only one planting is made.

Sweet potatoes are grown both on the upland and on the bottom-land soils.

On the latter the crop is sometimes planted after the removal of a crop of Irish potatoes or oats, but, as a rule, earlier planting is preferred. Fertilizer is not ordinarily used in the bottoms but is applied to some extent on the upland soils. The yields vary from 75 to 150 bushels per acre. The market price for sweet potatoes is generally about 40 to 50 cents a bushel.

In the upland, where the cultivated areas are usually small, the farm labor is largely performed by members of the family. On the larger farms in the Red River bottoms hired negro laborers perform most of the work, while negro families carry on the farm activities on many of the smaller farms. The supply of labor is adequate, and with good oversight the hands are fairly efficient. Day hands receive from 75 cents to $1. Women are extensively employed in hoeing and picking cotton, receiving about 50 to 75 cents a day. The large sawmills create a good demand for labor, and the extent of their operations has a marked effect on farm wages.

In 1910, according to the census, 28.7 per cent of the area of the parish was in farms and 43.2 per cent of the farm land was improved. The average size of farms was 87.6 acres.

The 1910 census reports 52.3 per cent of all farms as being operated by owners and 47 per cent by tenants. Where the tenant furnishes

only his labor the crop is divided equally between him and the landowner; where he furnishes everything except the land he receives two-thirds of the cotton and three-fourths of the corn. Most of the share tenants are negroes who farm 20 or 30 acres, the area cultivated varying with the number of members in the family, which limits the number of acres of cotton that can be tended and picked. Some of the Red River bottom-land farms are rented for cash by white farmers at prices varying from $2 to $5 an acre, depending on the location.

The better drained lands of the Red River bottoms are valued at $40 to $100 or more an acre, according to the location and improvements. Improved upland farms with good soil and drainage can be bought for $10 to $20 an acre, the price varying with the improvements and location. Cut-over pine lands can be bought from the sawmill companies and other owners in large tracts at very low prices, probably for $5 or less an acre. There is a large extent of this unimproved land which either has good drainage or can be drained easily and made to produce cotton, corn, oats, peanuts, cowpeas, and other crops. Much of this land, including the areas of Caddo, Susquehanna, and associated bottom-land soils and other types, could be seeded to Bermuda grass and lespedeza, and successfully used for stock raising.

SOILS.

The upland soils of Rapides Parish are all derived from Coastal Plain sediments, which consist of beds of unconsolidated sands, sandy clays, and more or less gravel. The gravel consists mainly of chert and quartz, and the sandy material is mainly derived from quartzitic rocks.

Some beds, apparently the uppermost, consist of friable sandy clay, while others, occurring in most cases beneath the sandy clay beds, consist of heavy, plastic clay.

Since their deposition the materials have been subjected to erosion and weathering, which have had a considerable influence in altering the surface configuration, in changing the color of the material, in accumulating and assimilating organic matter, and to some extent in washing down the finer particles from the upper soil in some of the more rolling areas, leaving a sandy surface layer containing little silt and clay. Also, ferruginous concretions and a compacted layer at depths of 2 or 3 feet, apparently the result of poor drainage, are encountered, chiefly in level and gently sloping areas where the surface drainage is poor or there is opportunity for seepage.

The stream-bottom and terrace soils consist of material deposited from overflow water over the flood plains of the streams. Such material obviously has been washed from the various soils occurring

in the drainage basins of the streams. That on the terraces and second bottoms was deposited when overflows reached a higher level than at present, while that in the first bottoms represents recently deposited materials, the youngest soil material of the area, over which additional sediments are laid down at each overflow.

Along the streams rising within the county or in the surrounding area where the soils are similar the alluvium represents wash from such upland soils as the Caddo, Ruston, Orangeburg, and Susquehanna. It has a brownish color in the better drained areas of the first bottoms and a gray or mottled grayish, brownish, and yellowish color in the more poorly drained situations, while on the second bottoms the best drained soils are reddish and brownish and the most poorly drained grayish or mottled grayish, brownish, and yellowish. Those of intermediate drainage are grayish in the surface soil and yellowish in the subsoil.

Along the Red River the alluvial soil has a peculiar chocolate-red color, entirely different from the red of any other soil of the area, such as the brick red of the Orangeburg, and the material is calcareous in part, at least in the lower subsoil or substratum, in contrast to all the other alluvial soils. Along this stream, which rises in western Oklahoma and northwestern Texas, there is enough of the red alluvium brought down from the Red Beds regions of Texas and Oklahoma to dominate the color.

Aside from those differences that exist between the upland and bottom-land soils, there are no very marked soil differences in the county dependent upon physiography. Over the more nearly level areas, as in the extreme southern part of the county, the soil is prevailingly silty, and there is a larger proportion of gray and mottled soil, while over the more rolling areas there is a much greater proportion of sandy material and the soil is of uniform color in both the surface-soil and subsoil sections. In the bottoms a silt loam texture predominates along all the streams other than the Red River, along which there is more clay, with considerable fine sandy loam in the higher situations near the channels of the bayous and the main stream itself.

The Orangeburg soils, which are the best drained soils of the uplands, consist of grayish to light-brownish surface soils overlying red, friable sandy clay subsoils. The topography is gently rolling to rolling. These soils often occur on well-drained slopes, grading into soils having lighter colored subsoils over the more nearly level uplands where the drainage is not so well established.

The Ruston series comprises grayish to light-brownish surface soils overlying light-red to reddish-yellow, friable sandy clay, which in places is slightly mottled with red and gray in the lower subsoil.

The surface characteristically is undulating to gently rolling and the soils are well drained.

The Caddo series consists of grayish surface soils overlying yellow subsoils which with increasing depth show gray, drab, and sometimes reddish mottlings. There is often a compact stratum in the lower subsoil. In many places dome-shaped mounds are irregularly distributed through these soils. The surface is nearly level or gently sloping, and the drainage, especially of the subsoil, is imperfect. These are upland soils, derived apparently from Coastal Plain deposits.

The Susquehanna soils are characterized by the grayish to light-brownish color of the surface material and the mottled red, yellow, gray, and bluish-gray color and plastic structure of the heavy clay subsoil. The surface ranges from flat to undulating or rather steeply sloping. The heavy subsoil is unfavorable to good underdrainage and aeration, and in the level areas the drainage usually is poor, although elsewhere it is adequate for agriculture as, owing to the sloping surface, the run-off is good. These soils are derived from the heavy clay beds of Coastal Plain material.

The Lufkin soils are characterized by the light-gray color of the material, the compact, impervious nature of the lower subsoil, a flat topography, and poor drainage. There is frequently some mottling of yellow and drab throughout the 3-foot section, and small brownish and black concretions and concretionary material are of common occurrence. Dome-shaped mounds, usually of Caddo material, are scattered through the Lufkin areas. This series includes the most poorly drained upland soils. It appears to be closely related in origin to the Caddo series.

The Crowley soils have brown to dark-brown surface soils and mottled dark-red and drab, plastic clay subsoils, which usually pass in the lower depths into yellowish plastic clay. The drainage is better than that of the Lufkin and poorer, on the average, than that of the Susquehanna. This series occurs as prairie soil in the northeastern part of the parish. The origin of the material is not very clear. Much of the flat country in this part of the parish has the appearance of being of stream-terrace origin, and may represent terrace land of the Mississippi River.

The Bienville series occurs on terraces. The surface soil is grayish and the subsoil yellow to mottled yellow and gray. The drainage is not so good as that of the Chattahoochee. Frequently dome-shaped mounds are encountered in areas of these soils.

The Chattahoochee series also occurs on stream terraces. The surface material is grayish, while the subsoil is red and friable. The surface ranges from level to billowy. Drainage is well established.

The Muskogee series includes types with grayish or yellowish sur-

face soils overlying yellowish clay, which is mottled with gray and is compact in the lower part. The drainage is moderately good. This series is found on terraces of the Red River.

The Leaf soils occur on the same type of stream terraces as the Bienville and Chattahoochee. The surface soils are brown, while the subsoils are mottled red, gray, yellow, and drab, and are of plastic structure. The surface is level or nearly level, and the drainage is imperfect.

The Ochlockonee series includes the brown soils of the first bottoms of streams which receive wash largely from local upland soils, such as the Caddo, Ruston, Orangeburg, and Susquehanna. Rusty-brown, yellowish, and grayish mottlings frequently occur in the subsoil, especially of the heavier types, but brown is the characteristic color, at least of the surface soil and upper subsoil. These soils are subject to overflow, but between periods of overflow the drainage is fair to good.

The Miller soils are confined to the bottom lands of the Red River. They have a dark chocolate red color, except in the case of the sandy types, which are a lighter shade of red. The lower subsoil and substratum frequently are calcareous. The surface is level to hummocky, and the drainage between overflows is good, except in the lower lying swampy areas of the clay type.

The miscellaneous type mapped as Swamp includes low-lying areas of poorly drained soil consisting of peaty material mixed with alluvium.

In the following pages of this report the various soil types mapped are described in detail, and discussed in their relation to agriculture. The distribution of the soils is shown on the accompanying map, and the actual and proportionate extent of each is shown in the table below:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Miller clay	40,896	17.6	Orangeburg fine sandy loam	25,728	3.0
Swamp phase	111,488		Lufkin silt loam	21,888	2.5
Ruston fine sandy loam	141,248	16.4	Swamp	13,376	1.5
Light phase	832		Ochlockonee silty clay loam	8,128	.9
Susquehanna very fine sandy loam	128,000	14.8	Leaf very fine sandy loam	3,648	.4
Ochlockonee silt loam	91,712	10.7	Miller very fine sand	3,072	.4
Light-colored phase	576		Muskogee very fine sandy loam	2,304	.3
Caddo very fine sandy loam	83,776	9.7	Crowley silt loam	2,048	.2
Miller very fine sandy loam	54,272	6.3	Leaf silt loam	1,984	.2
Miller silt loam	37,888	4.4	Chattahoochee very fine sandy loam	1,152	.1
Susquehanna silt loam	8,704	3.8	Bienville loamy sand	1,088	.1
Better drained phase	24,384				
Caddo silt loam	29,888	3.5	Total	865,920	
Ruston very fine sandy loam	27,840	3.2			

ORANGEBURG FINE SANDY LOAM.

The Orangeburg fine sandy loam consists of gray to brownish-gray loamy fine sand, passing at about 5 inches into a gray or pale-yellowish loamy fine sand. This grades at about 8 to 10 inches into a yellowish to reddish fine sandy loam, which is underlain at depths of about 10 to 15 inches by red, friable sandy clay. There are a few included patches of Orangeburg very fine sandy loam and Ruston soils. This type has a smoother topography than the Ruston fine sandy loam. It is friable and very easy to cultivate.

The type occurs in scattered small areas in the uplands. It occupies slopes, the crests of ridges, and the tops of hills, and the surface characteristically is rolling to gently rolling. Frequently the slopes below are occupied by Susquehanna or Ruston soils. The drainage is thorough, yet the soil holds water very well.

This is not an extensive type, but it is locally important, and a larger proportion of it is cultivated than of any other type in the uplands.

The forest growth consists chiefly of longleaf pine, with a scattering of oak.

The principal crop is cotton, with corn, oats, sugar cane, and sweet potatoes grown for home use. Somewhat larger yields are obtained than on the Ruston fine sandy loam. The same farming methods are practiced as on that type, and land values are practically the same.

This is considered one of the most productive of the upland soils of the Coastal Plain region. In other parts of the South acreage yields of 1 bale of cotton and 40 bushels or more of corn are often obtained with moderate applications of commercial fertilizers. Usually about 300 to 400 pounds of a mixture analyzing about 8–3–3 are applied. In parts of Georgia, Alabama, Mississippi, and Texas this type is used successfully for the commercial production of peaches.

RUSTON FINE SANDY LOAM.

The Ruston fine sandy loam consists of a grayish loamy fine sand, passing at about 6 to 8 inches into pale-yellow fine sandy loam. This, at about 10 to 20 inches, grades into dull-red to reddish-yellow, friable fine sandy clay. In places there is some mottling of gray and yellow in the lower part of the subsoil. The lower subsoil frequently is compact. Some dome-shaped mounds occur, in which the depth to clay is greater than typical.

As mapped, there are some included areas of Ruston very fine sandy loam too small and irregularly distributed to be mapped separately. On the other hand, in some small areas the soil ranges to a medium

sandy loam. A number of areas of gravelly soil are shown with gravel symbols; some other included gravelly areas are too small to be indicated. The gravel consists of small, rounded chert and quartz pebbles. In a few small areas the sand is 3 feet or more in depth.

This type is extensively developed throughout the uplands. The surface is gently rolling to rolling and drainage is good. The surface, on the average, is more uneven than that of the Caddo very fine sandy loam, but the type can be cultivated without danger of erosion except on a few of the steeper slopes. The soil holds sufficient moisture for crops through the average season. The forest growth is mainly a heavy cover of longleaf and shortleaf pine.

This is an extensive soil, and is important in the agriculture of the uplands, although probably 75 per cent of it has never been farmed. The unused portion is occupied by a heavy growth of longleaf pine with some shortleaf pine, or consists of cut-over land.

Cotton is the most important crop. On every farm some corn is grown, and usually there is a patch of sugar cane for the production of sirup for home use and to a small extent for sale. Many farms also have small fields of oats and sweet potatoes, and occasionally peanuts, grown for home use. Sweet potatoes are produced for market in the vicinity of Cheneyville. A few hogs and cattle are raised on most farms, and occasionally stock is sold to local butchers or stock buyers.

Cotton yields one-fourth to one-half or possibly, in the best managed fields, three-fourths bale per acre, corn 15 to 30 bushels, oats 25 to 30 bushels, sugar cane 200 to 250 gallons of sirup, and sweet potatoes 150 bushels or more. Yields vary with the season, the cultivation given, and the quantity of manure or fertilizer applied.

In the preparation of the seed bed, 1-horse light turning plows are in general use. Plowing is done to a depth of about 3 to 4 or 5 inches. Cultivation of the growing crop is generally shallow and is performed usually with the shovel type of plow drawn by a single horse or mule. Cotton, corn, and sugar cane are grown on ridges, while oats generally are sown broadcast, plowed under, and left unharrowed. Little attention is given to the rotation of crops, although cowpeas are sometimes sown in corn at the last cultivation and broadcasted after oats. Some farmers apply barnyard manure, but in small quantities. A few make light applications of acid phosphate, acid phosphate and cottonseed meal mixed, or of low-grade mixed fertilizers for cotton and sugar cane and sometimes corn, but seldom for oats.

The present selling price of this land ranges from about $10 to $20 an acre, depending upon the location, topography, and improvements. Unimproved, cut-over land can be bought for about $5 an acre in some sections.

The Ruston fine sandy loam is an important soil, especially in the production of cotton, corn, and peanuts, over large areas in eastern Texas, Louisiana, and southern Arkansas and in Mississippi and Georgia. The peanuts are grown as a field forage crop for fattening hogs, and this industry has proved successful, particularly in Alabama and Georgia. Present indications are that this crop may become important for the production of oil. Yields of 1 bale of cotton or 40 bushels or more of corn are frequently obtained on this soil in Mississippi, Alabama, and Georgia, especially where cowpeas are grown in rotation with the clean-cultivated crops and where 300 to 500 pounds per acre of a fertilizer mixture analyzing about 8–3–3 (8 per cent phosphoric acid, 3 per cent nitrogen, and 3 per cent potash) is applied. There is no apparent reason why similar results can not be obtained in this parish. Yields can be materially increased without the use of fertilizer by deeper plowing in the fall and by growing such soil-improving crops as cowpeas, velvet beans, and peanuts in rotation with the other crops.

Ruston fine sandy loam, light phase.—The surface soil of the Ruston fine sandy loam, light phase, is gray to brownish gray. It consists of a mixture of fine sand and medium sand to a depth of about 15 inches, and is underlain by a brown to a yellowish-red loamy sand, which becomes heavier with depth and gradually passes into a reddish-yellow sandy clay at about 3 feet. The surface soil is loose textured and open. In places on the steeper slopes the sand extends to a depth of several feet before the underlying layer of sandy clay is reached.

The largest area of this phase occurs south of Bayou Rapides, near Quadrate. It occupies rather steep slopes, extending into the adjoining rolling country. A few areas occur on narrow ridges. Drainage is good, owing to the rolling topography and the open and porous nature of both surface soil and subsoil.

A very small percentage of the phase is under cultivation; most of it supports a growth of longleaf pine. The soil is unimportant agriculturally. It is utilized for growing cotton and corn, the yields averaging slightly less than on the typical Ruston fine sandy loam.

The phase has about the same selling value as the typical soil.

RUSTON VERY FINE SANDY LOAM.

The Ruston very fine sandy loam consists of a brownish-gray very fine sandy loam, underlain at about 5 or 6 inches by pale-yellow, heavier, very fine sandy loam which grades at about 10 to 12 inches into dull-red to reddish-yellow, friable fine sandy clay. There is some yellowish-red mottling in the lower subsoil in places. This soil is more compact at the surface, when dry, than the Ruston fine sandy loam, and the depth to clay is usually not so great.

This type occurs principally in the northeastern and southwestern parts of the parish. It occupies undulating or gently undulating areas. The drainage is well established. A smaller proportion of this type is cultivated than of the Ruston fine sandy loam, but it is quite extensive and important in the agriculture of the parish. The areas farmed are used mainly for cotton and corn. The soil is handled in the same way as the Ruston fine sandy loam. Owing to its finer texture it becomes more compact and requires somewhat heavier equipment for efficient plowing.

The following table shows the results of the mechanical analyses of the soil and subsoil of the Ruston very fine sandy loam:

Mechanical analyses of Ruston very fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
431805	Soil	0.1	1.2	1.6	37.2	32.0	24.2	3.6
431806	Subsoil	.0	.4	.9	30.6	23.0	21.0	23.8

CADDO VERY FINE SANDY LOAM.

The Caddo very fine sandy loam consists of a grayish very fine sandy loam, underlain at an average depth of about 5 inches by pale-yellow very fine sandy loam which passes through pale-yellow fine sandy clay loam into yellow clay at about 8 or 10 inches. The lower subsoil shows reddish and often grayish mottlings, the lower part usually consisting of a compact fine sandy clay of mottled red, grayish, and yellowish color and moderately friable structure. This lower subsoil resembles in color the subsoil of the Susquehanna series, but it is more sandy and more friable. Dome-shaped mounds occur in many places. The soil of these mounds is the Ruston very fine sandy loam and Caddo very fine sandy loam, with comparatively little mottling in the subsoil. In places, particularly in the level areas, small black concretions are common throughout the 3-foot section, being especially abundant in the compact lower subsoil of some areas. Ferruginous material of the same character as the concretions is also present in many places. As mapped this type includes some patches of the Caddo fine sandy loam, Ruston fine sandy loam and very fine sandy loam, and the Susquehanna very fine sandy loam and silt loam, occurring in areas too small and irregular to be mapped satisfactorily.

The Caddo very fine sandy loam is an extensive upland soil. The surface is gently undulating to nearly level as a rule, but there are some areas, as the large one west of Libuse, which have a gently rolling surface. Surface drainage is prevailingly good, except in the

level areas, but the underdrainage is not so thorough. Most of this land has sufficiently good drainage, however, for cultivation, and all of it could readily be drained and put in good condition for crop production by ditching.

Little more than 10 per cent of this type is cultivated. There are large areas of recently cut-over land, with many longleaf-pine stumps that are difficult to remove. Some of the type is occupied by a heavy growth of longleaf pine, but this is rapidly being removed.

Cotton is probably the most important crop. Corn, oats, and sugar cane are also grown. The type is used to some extent as range land for beef cattle and hogs. Fairly good pasturage is available in summer, but there is little in winter. In the vicinity of Libuse small areas are used for growing strawberries.

According to the statements of farmers, cotton yields about one-fourth to one-half bale per acre, corn 15 to 30 bushels, and oats about 20 to 35 bushels. Sugar cane produces 200 to 250 gallons of sirup per acre.

The Caddo very fine sandy loam is handled with light implements and 1-horse plows. The land rarely is broken to a greater depth than 3 or 4 inches, and little harrowing or disking is done in preparing the seed bed. Cotton, corn, and sugar cane are grown on beds thrown up by turning plows, while oats are broadcasted and plowed under shallow, the land being left in the rough. Cotton, corn, and sugar cane are cultivated with 1-horse shallow-running plows at rather frequent intervals. For these crops a few farmers make acreage applications of 100 to 200 pounds of acid phosphate, or a mixture of acid phosphate and cottonseed meal and low grades of ready-prepared fertilizer mixtures, but the majority use no fertilizer except a little barnyard manure. Occasional shallow ditches are dug to assist the drainage, but some cultivated areas receive little attention in the way of drainage improvement.

The present price of improved farm land of this type ranges from about $8 to $15 an acre. Large areas of the cut-over land can be bought at lower prices.

This type of soil in various parts of Louisiana, southern Arkansas, and eastern Texas has been converted into a fairly good farming soil by ditching, moderately deep plowing, and the growing of organic-matter supplying crops, such as cowpeas, in rotation with the clean-cultivated crops. By building up the organic content through the addition of manure or by turning under such crops as cowpeas, fairly good average yields of cotton, corn, oats, and sugar cane can be produced. Acreage applications of about 400 to 600 pounds of commercial fertilizers, analyzing about 10–3–3, have been profitable on soils very similar to this in the Carolinas and Georgia, yields of 1 bale of cotton or 40 to 50 bushels of corn per acre fre-

quently having been obtained. The first requirement of the more poorly drained areas is ditching or tiling. The soil is somewhat acid, according to the litmus-paper test, and lime or ground limestone apparently should be added.

Much of the unused land undoubtedly could profitably be utilized for the raising of beef cattle, by growing Bermuda grass, cowpeas, and sorghum hay, and for raising hogs by growing peanuts, oats, sorghum, and cowpeas as field forage crops. Such use of the land would not necessitate the immediate removal of the stumps. The type is used successfully in other sections for the production of Bermuda-grass hay.

CADDO SILT LOAM.

The Caddo silt loam in its typical development consists of a grayish silt loam which passes at about 5 or 6 inches into pale-yellow silty clay loam, this in turn grading at about 8 or 10 inches into moderately friable clay. Below depths ranging from 15 to 24 inches mottlings of red, or reddish yellow, gray, and pale yellow occur. The lower subsoil is characteristically compact and mottled with gray, yellow, and red. A large admixture of small brownish and black iron concretions and other ferruginous material is present, especially in the compact stratum. This compact stratum resembles in color the subsoil of the Susquehanna series, but contains more fine sand and is more friable. In the more poorly drained, level areas gray mottling may occur nearer the surface than elsewhere. Dome-shaped mounds are of common occurrence in areas of this type. In these the soil is mainly the Caddo fine sandy loam or very fine sandy loam or the Ruston very fine sandy loam, and there is considerable depth to the clay subsoil. These mounds are well drained. As mapped, the type includes some Lufkin silt loam and silty clay loam and Caddo very fine sandy loam.

This is an extensive type in the eastern and southern parts of the parish. The surface is level to undulating, and lies a little higher than the associated Lufkin silt loam. The drainage is considerably better than in the Lufkin soil, but over much of the area it is imperfect. The forest growth consists mainly of longleaf pine. Broom sedge is abundant.

Even less of this type is in cultivation than of the Caddo very fine sandy loam. It is used for the same crops and is handled in the same way, and gives very nearly the same yields. It can not be maintained in a good tilth as easily as the very fine sandy loam, as it generally bakes more on drying.

The land is held at the same price as the Caddo very fine sandy loam. Much of it consists of recently cut-over land.

This soil is more generally in need of ditching than the Caddo very fine sandy loam, as there is a larger proportion of level land. The same methods of farming, however, are adapted to both types. The application of lime or ground limestone after draining would undoubtedly prove beneficial, as would the use of phosphatic fertilizers, especially in hastening the maturing of cotton to avoid damage by the boll weevil.

SUSQUEHANNA VERY FINE SANDY LOAM.

The Susquehanna very fine sandy loam consists of grayish, loamy very fine sand overlying pale-yellowish to grayish very fine sandy loam at an average depth of about 5 inches. This, in turn, passes at about 8 to 15 inches into stiff, plastic clay, mottled red and yellow, or red, gray, and yellow. The lower subsoil is mottled either reddish, yellowish, and drab or reddish and drab. In places the upper subsoil is yellow or mottled yellowish and grayish, the red appearing below. On the other hand, the upper subsoil is, on some well-drained slopes, almost solid red. There are included areas of Susquehanna fine sandy loam, Caddo very fine sandy loam, and Ruston fine sandy loam.

This type is widely distributed throughout the uplands. It occurs chiefly on slopes along stream bottoms and drainage ways, and in gently rolling and undulating areas. The drainage is good.

The type is fairly extensive but it is of little importance in the present agriculture, aside from its use in places as range land. Some small areas are used for growing cotton, corn, and oats. Cotton seems to give best results, yielding in some instances as much as one-half bale per acre under the ordinary cultural methods used in the uplands.

Land of this type has about the same selling value as that of the Ruston soils.

This type is used successfully in Texas, Arkansas, and in parts of Louisiana for the production of cotton and of Bermuda-grass hay and pasturage. Bermuda grass yields well, although it usually does not grow very tall. Lespedeza succeeds and probably could be grown successfully as a pasture crop. Growing this legume improves the soil and results in better yields of cotton, corn, and oats. This soil requires about the same treatment as the Caddo very fine sandy loam.

SUSQUEHANNA SILT LOAM.

The Susquehanna silt loam, as typically developed, consists of brownish to grayish silt loam, about 4 or 5 inches deep, overlying pale-yellow or mottled yellowish and grayish silt loam. This is underlain at about 8 to 12 inches by yellow clay which, as the depth increases, becomes mottled first with gray and in the lower part with

red and drab. The lower subsoil is very plastic and adhesive when wet. It does not crumble under pressure like the lower subsoil of the Caddo series. In places on slopes and in undulating areas where the drainage is better than in the flat areas the upper subsoil is a mottled red and gray, plastic clay, the red being more conspicuous than in the lower subsoil. Also, on the slopes the material usually is more sandy, ranging to a very fine sandy loam.

The surface ranges from level to very gently sloping and gently undulating. In the flat areas the drainage is imperfect, although better than that of the Lufkin silt loam, and small brownish iron concretions are abundant in many places. As mapped, this soil includes patches of the Susquehanna very fine sandy loam and the Caddo silt loam and very fine sandy loam. The type occurs chiefly in the northeastern part of the parish, where it is fairly extensive. The timber consists of shortleaf and longleaf pine, with some oak and black gum.

This soil is of little importance in the present agriculture of the parish. Practically none of the flat land is cultivated, but it is used in a small way for pasture. A small part of the undulating land is used for the production of cotton and corn. Crop yields are about the same as on the Susquehanna very fine sandy loam, and the type is handled in about the same way.

The flat areas can not be farmed successfully until sufficient ditching has been done to remove excess rain water from the surface. Indications are that the type can best be used for growing Bermuda grass and lespedeza as hay and pasture crops. If irrigation water were available the flat areas could probably be used for rice production. Similar land is used successfully for this purpose in other parts of the State.

Susquehanna silt loam, better drained phase.—A better drained phase of the Susquehanna silt loam is shown on the map by means of ruling over the color used for the typical soil. This phase occurs in sloping and undulating areas in the northeastern and northwestern parts of the parish, and, aside from the matter of drainage, differs little from the typical soil except that the surface soil may contain a little more sand.

LUFKIN SILT LOAM.

The Lufkin silt loam consists of a brownish-gray or mottled gray and rusty-brown silt loam, underlain at about 1 to 2 inches by a light-gray compact silt loam, which passes at about 6 to 10 inches into mottled grayish and yellowish or grayish and rusty-brown silty clay loam. The lower subsoil, beginning at about 20 to 24 inches, is either a yellowish, tough, plastic, impervious clay or a gray to drab, compact silty clay loam to silty clay, frequently mottled with rusty brown and containing a large quantity of small black and brownish concre-

tions. These concretions usually are present throughout the soil section. In places the subsurface material is pale yellow, mottled with gray. Dome-shaped mounds, 2 or 3 feet high and 20 to 40 feet in diameter, are abundant in places. The soil of these mounds is a brownish silt loam to very fine sandy loam, underlain by a pale-yellow silt loam or silty clay loam which passes into mottled yellowish and grayish silty clay.

In Holloway Prairie, in the northeastern part of the parish, some Lufkin silty clay loam is included with this type. This consists of a mottled gray and rusty-brown silty clay loam grading quickly into light-gray silty clay loam, with some rusty-brown mottling. This at about 18 to 20 inches passes into gray, plastic clay in places, mottled with rusty brown or yellowish brown. Small ferruginous concretions are abundant. Mayhaw is a characteristic growth on this soil, which is known locally as "mayhaw slash" land.

The Lufkin silt loam is extensively developed in the southern part of the parish, and there are a large number of both small and fairly large areas in the northeastern part. The surface is level and drainage is very poor, water standing on the surface for long periods after heavy rains.

Practically none of this type is cultivated. It is used to some extent as range land for beef cattle. The forest growth consists chiefly of white oak, sweet gum, black gum, maple, and pine.

Land of this type is valued at about $5 an acre. The best use of this land appears to be for growing lespedeza for pasturage and hay. With better drainage it is possible that sugar cane could be grown for sirup and that oats and Bermuda grass would prove successful crops. In southeastern Arkansas, in the vicinity of Experiment, this soil, with irrigation, is successfully utilized for the production of rice. If water can be obtained economically, there seems to be no reason why this type could not be used in this parish for growing rice. The soil becomes compact on drying, and for cultivated crops it would be necessary to maintain a good organic-matter supply in order to maintain a good tilth. Applications of lime would tend to improve the soil in this respect.

CROWLEY SILT LOAM.

The Crowley silt loam consists of a brown silt loam, underlain at about 8 to 10 inches by mottled dark-red and drab, plastic clay, which usually passes into yellowish, sticky clay in the lower subsoil.

The type occurs in comparatively small areas in Holloway Prairie, in the northeastern part of the parish. The surface is faintly sloping to level; the drainage is only moderately good, although better than that of the associated "mayhaw slashes" (Lufkin silty clay loam) occupying the lower, level areas of the prairie.

Owing to its small extent this is not an important soil, although it is locally esteemed as pasture land. Cotton, corn, and oats, grown in a small way, give satisfactory yields when the seasons are not too wet. The type is considered very productive.

All of this land could be used to advantage for oats, corn, and hay. Crops like corn and oats would give better average returns if the land were ditched. The type is used with success in the Stuttgart region of Arkansas for rice production.

BIENVILLE LOAMY SAND.

The Bienville loamy sand consists of a brown to rusty-brown or coffee-brown loamy sand, passing into a lighter brown loamy sand which in places has a reddish cast.

Soil of this type occurs in many small, islandlike areas along the outer bottoms of the Calcasieu River in the "big-hammock" country and elsewhere along that stream, in similar positions in the northeastern part of the parish, and on Spring Creek in the southern part. Its total area is small. The type occupies a terrace, standing rather conspicuously above the bottoms, lies above normal overflow, and has good drainage. The surface is nearly level.

This soil is forested, the growth consisting of shortleaf pine, oak, holly, and beech. It should prove a valuable, productive soil for cotton, corn, and forage crops.

CHATTAHOOCHEE VERY FINE SANDY LOAM.

The Chattahoochee very fine sandy loam is a light-gray, loose, very fine sand, passing at about 6 to 8 inches into yellowish, very fine sandy loam. This is underlain at about 10 to 20 inches by red, friable, fine sandy clay.

The type occurs mainly on the second bottoms of the Calcasieu River and along the upper course of Spring Creek in the western part of the county, the larger areas being found in the "big-hammock" section. The surface is billowy to nearly level, and the drainage is good.

This soil is not very extensive, but most of it is in cultivation, and it is locally important. It is used for the production of cotton and corn and produces fairly good yields.

Two areas included with this type consist of reddish-brown, fine sandy loam, underlain at 6 to 10 inches by red, friable, sandy clay. These areas occur just southwest of Big Hammock School, and if of sufficient extent to warrant separation would be mapped as the Amite fine sandy loam. This red terrace land is quite productive. It is used mainly for cotton.

In the following table are given the results of the mechanical analyses of samples of the soil and subsoil of the Chattahoochee very fine sandy loam:

Mechanical analyses of Chattahoochee very fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
431839	Soil	0.2	0.8	2.2	59.0	19.4	15.2	3.1
431840	Subsoil	.0	.2	1.5	44.6	13.8	13.0	26.8

MUSKOGEE VERY FINE SANDY LOAM.

The Muskogee very fine sandy loam consists of a yellowish-gray very fine sandy loam, underlain at about 8 to 10 inches by yellow moderately friable clay. The lower part of the subsoil is mottled with gray and has a compact structure.

This soil occurs in a large number of rather small areas on the second bottoms of the Red River and Clear Bayou. It stands above overflow, except the lower areas, which are sometimes inundated by unusually high water. The surface of the type is level to slightly undulating, the original surface having been altered somewhat by erosion. The drainage is fairly good.

This soil is of little importance, owing to its small total area. Some of it is under cultivation to cotton, corn, and sugar cane, and in the vicinity of Alexandria it is used to some extent for market gardening. Yields are good where the land is properly handled and fertilized.

LEAF VERY FINE SANDY LOAM.

The Leaf very fine sandy loam consists of grayish to pale-yellowish or light-brownish very fine sandy loam, passing into yellow or yellowish-red, moderately friable clay, and this into mottled red, yellow, and gray or drab plastic clay. There are some dome-shaped mounds, in which the plastic, mottled clay lies at lower depths.

This soil occurs in level areas largely on the second bottoms of the Calcasieu River, in the western part of the parish. It lies above normal overflow. Nearly all of it is forested, the principal trees being oak, beech, shortleaf pine, and holly. A few areas have been cleared and are used for cotton and corn.

The type is not very important in the agriculture of the parish because of its small extent, but locally it is considered a fair corn and cotton soil, producing as much as 30 to 40 bushels of corn per acre and one-half bale or more of cotton.

The type is valued at about $10 to $20 an acre.

As the surface drainage of this type is rather poor, and the structure of the subsoil is unfavorable to the rapid downward movement of moisture, it is advisable to install ditch or tile drains. The type probably could be used profitably for the production of Bermuda grass and lespedeza hay and also rice if irrigation water could be applied at a reasonable cost. In other sections oats, cowpeas, sorghum, and sugar cane give good results on this soil.

The results of the mechanical analyses of samples of the soil and subsoil of the Leaf very fine sandy loam are given in the following table:

Mechanical analyses of Leaf very fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
431835....	Soil.....	0.1	0.4	0.9	30.2	22.0	36.6	9.8
431836....	Subsoil.....	.0	.1	.2	21.6	14.4	29.8	33.7

LEAF SILT LOAM.

The Leaf silt loam consists of a brownish silt loam, underlain at about 6 inches by mottled red, yellow, and gray plastic clay.

This type occurs in the western part of the parish on the second bottoms of the Calcasieu River. It is level or nearly level, and lies somewhat higher than the surrounding second-bottom soils, including the Leaf very fine sandy loam. Its drainage is consequently better established.

The total area of this soil is small. A part of the type is cultivated to cotton and corn, which do fairly well. Bermuda grass and lespedeza should succeed.

OCHLOCKONEE SILT LOAM.

The Ochlockonee silt loam consists of a brown silt loam which grades below either into a yellowish-brown silty clay loam to silty clay or into a light-brown silty clay loam, with some grayish mottlings in the lower subsoil and frequently some dark concretionary material.

As mapped, this type includes some Ochlockonee silty clay loam and very fine sandy loam and Bibb silty clay loam and silt loam. These soils can not be shown satisfactorily on the map on account of their small extent. The forest growth consists mainly of ironwood, magnolia, sweet gum, black gum, holly, shortleaf pine, birch, oak, and maple, with some cypress and willow in the included wet depressions.

This type is extensively developed in the first bottoms of all the streams of the parish except the Red River. It occurs in strips from a few rods wide to bottoms several miles in width. The surface is level, except for occasional abandoned stream channels and hummocks and swells. All the type is subject to overflow. Between overflows drainage is fairly good.

Very little of this type is cultivated, although most of it is used to some extent as pasture. Along some of the smaller streams small patches are used for growing cotton and corn. The type is valued chiefly for its timber and as pasture. It can be bought for $8 to $30 an acre, the price depending on the timber growth and location.

The fact that heavy, destructive overflows may occur at any time discourages the use of this land for cultivated crops. Bermuda grass and lespedeza have proved profitable on this type in other parts of the South both for hay and pasturage, and probably the best use of the land in this parish would be for growing these crops. Some hay might be lost occasionally, but both lespedeza and Bermuda grass withstand overflows well and are cheaply produced. White clover does well on this land, and there seems to be good opportunity for the development of hay production and stock raising on this very extensive type of soil. Rice possibly could be grown. Other crops that have been grown successfully on this type in other sections are corn, oats, sorghum, sugar cane, cowpeas, and cotton. Probably these crops could be grown in this parish with the straightening and enlarging of the stream channels, to give proper protection from overflow and the extension of lateral ditches and drains through the fields. Only the earlier maturing varieties of cotton should be grown, and phosphatic fertilizers, such as acid phosphate, should be used to hasten the fruiting of the crop.

Ochlockonee silt loam, light-colored phase.—The Ochlockonee silt loam, light-colored phase, consists of a light-gray to nearly white fine sandy loam which passes into light-gray silty clay, with some yellow mottling. The lower subsoil is characteristically a compact, impervious clay, frequently containing black concretions. If of sufficient extent and importance in the parish to warrant its classification as a separate type, this soil would be mapped as the Bibb.

The phase occurs in the first bottoms of the Calcasieu River. It is subject to overflow, and its drainage is very poor between flood periods. It is forested with about the same trees that occur on the other Ochlockonee soils. The type is not extensive, and is of little importance. It is used to some extent for grazing cattle and hogs.

This soil has been cleared in some parts of the South and is used successfully for growing lespedeza and native grasses for hay and pasturage. It also is used to some extent for the production of corn,

oats, and cotton, but the yields are uncertain. It is possible that rice could be grown successfully.

OCHLOCKONEE SILTY CLAY LOAM.

The Ochlockonee silty clay loam consists of brown silty clay loam, often mottled with rusty brown and gray, underlain at 6 or 8 inches by light-brown silty clay, mottled, especially in the lower part, with gray or drab and containing some black concretions and ferruginous material in the lower subsoil. Some included areas resemble closely the Bibb soils, and some represent what has been mapped elsewhere as the Lee silty clay loam. It is not practicable to make a satisfactory separation of these soils in this parish.

The most extensive occurrence of this type is in the bottom lands of the Calcasieu River and Cypress Bayou, in the western part of the parish. The type is forested, and is subject to heavy overflows. It exists under the same conditions as the Ochlockonee silt loam, and is used to some extent as pasture land for beef cattle and hogs. The possibilities of this type are the same as those of the Ochlockonee silt loam, the chief difference being that, on account of its heavier texture, this soil would be more difficult to till and more inclined to clod.

MILLER VERY FINE SAND.

The Miller very fine sand consists of a loose, light-reddish very fine sand which in places becomes slightly darker in color and more compact in the subsoil. Generally there is little change in the 3-foot section except for the presence of occasional thin strata of heavier material.

This type is confined almost wholly to the banks of the Red River and represents the first material deposited when the river overflows. The recently deposited material on the inside of bends and some rather low areas of river wash are included with this type; these small areas have no agricultural importance and are generally covered with willow, cottonwood, and cockleburs. The type is crossed by old channels. The drainage is good.

The Miller very fine sand is of little agricultural importance, though some of it is farmed south of Alexandria. Crop yields are light, except where the land is manured or crops such as cowpeas are grown to keep up the organic-matter supply. Sweet potatoes are said to do well. As this is a well-drained, early soil, it might be used to advantage for the production of truck crops. Much of the type south of Alexandria lies outside the levee and is used for pasture only. Bermuda grass does fairly well.

MILLER VERY FINE SANDY LOAM.

The Miller very fine sandy loam consists of a chocolate-brown or light-reddish, friable very fine sandy loam, underlain at about 15 to 20 inches by chocolate-red very fine sandy loam, which is somewhat heavier in texture than the surface soil and often grades into silt loam at depths of about 20 to 30 inches.

This type is second in extent to the Miller clay in the Red River bottoms. Agriculturally it is one of the most important soils in the county. It occupies the highest and best drained areas of the bottom lands, occurring almost invariably along the banks of the river and the larger bayous. It is composed of the first sedimentary material deposited when the streams overflow and the water runs back toward the swamps with gradually decreasing velocity. At some points, especially on the outside of bends in the tortuous courses of the streams, the overflows probably have been extensive and the currents rapid, as the light-textured material extends back in some places as much as 1 mile from the river. In other places, along the inside or concave side of the bends and where the adjoining land is lower than the immediate banks of the water course, these lower lying areas were covered with water which backed up through the natural drainage channels before overflow of the main stream took place, and as the velocity of the overflow water was arrested when it met the back water the coarser soil material has consequently been deposited in a narrow strip along the stream bank. The surface is flat or slopes very slightly away from the stream. Practically all this type is under cultivation. It is the best drained, earliest, and most easily tilled bottom soil in the parish. It is productive of all crops and is highly prized as farm land. Cotton, corn, and sugar cane are the principal crops. Near Alexandria considerable truck is grown on this soil. Yields in normal seasons are very good, corn producing an average of over 20 bushels, cotton about two-thirds bale, and the first-year crop of sugar cane about 20 tons of cane per acre.

The usual crop rotations and farming methods are employed, but only light teams and equipment are required on this type. It is said, however, that in wet weather constant cultivation is necessary, as the soil readily runs together and packs after rains, and, since the capillary movement of water is rapid, considerable moisture is lost through evaporation. Nut grass (coco grass) and Bermuda and Johnson grass spread more rapidly on this soil than on the heavier types, and the land requires constant tillage. In a wet season the grass grows so fast that the only effective method of control, it is said, is to grow the crops on ridges and use a turning plow to cover and smother the grass as soon as the ground is dry enough to work.

Well-located small farms on this type within a few miles of Alexandria sell for over $100 an acre, but larger tracts at greater distances from markets and consisting only in part of this type can be bought at prices as low as $40 or $50 an acre.

The growing of cowpeas on this soil is especially beneficial, as the supply of organic matter has been depleted with continuous clean cropping, causing the soil to be incoherent and droughty. The growing of soy beans and peanuts for hogging off also increases the productiveness of the soil.

MILLER SILT LOAM.

The Miller silt loam consists of about 8 to 12 inches of chocolate-brown to dark chocolate red silt loam, underlain by silty clay loam to clay, which is usually somewhat lighter in color than the surface soil. Occasionally this approaches the texture of a very fine sandy loam or includes strata of lighter textured material. There are included some sandy patches that usually are rather moist and have a dark color. These damp spots are known as "saltpeter land," and are considered cold and late for crops.

The Miller silt loam is intermediate in texture and location between the clay and very fine sandy loam, and is commonly known as "mixed land." It occurs throughout the Red River bottoms, generally lying between the Miller clay and very fine sandy loam or occupying slightly elevated areas in the former and depressed areas in the latter. The surface is almost level, and the drainage is not so good as that of the very fine sandy loam.

This is an important agricultural soil, and practically all of it is under cultivation. It is nearly as easily tilled as the very fine sandy loam. It is more resistant to drought and stronger than the clay, and lacks the cracking tendency of that soil. The type is slightly later in drying out in the spring and in maturing crops, and could be improved by providing better surface drainage.

A large number of crops seem to do well on this soil, but it is used principally for cotton, corn, and sugar cane. In normal seasons and where well cultivated, these crops produce slightly higher yields than on the Miller very fine sandy loam. The usual rotations are practiced. Farms containing large areas of this land are valued at $50 or more an acre.

The maintenance of a good supply of organic matter, deep and thorough plowing, and the growing of the legumes in rotation with other crops are needed on this soil to maintain good average yields.

MILLER CLAY.

The Miller clay consists of a dark chocolate red or chocolate reddish brown clay, underlain at about 6 to 8 inches by a somewhat

lighter chocolate red clay, which typically extends without important change throughout the remainder of the 3-foot section. In places the lower subsoil becomes somewhat lighter in texture or includes strata of silt or very fine sandy loam. Such areas would be mapped as the Yahola clay if of sufficient size and uniformity, although there is little agricultural difference between them and the typical Miller clay, particularly where the lighter strata lie at considerable depth. The soil is very sticky when wet. The subsoil is calcareous in places.

This type, including the swamp phase, is the most extensive of the Red River bottom soils. It occupies the lower lying areas where the flood water of the river moves slowest. It generally occurs some distance back from the river and the bayous that have carried the flood waters of the river, except where the water has backed up through drainage channels and completely filled the depressed areas before overflow of the banks took place. Thus where Bayou Rapides and Bayou Robert are comparatively close to the bluff the Miller clay covers nearly all the intervening space, and the same is true of much of the bottoms lying north of the river. Along the upper part of Bayou Boeuf the banks are low and are occupied by the Miller clay.

The drainage of this type is somewhat variable. Where the silt loam grades into the clay there is in some places a distinct slope, and where the clay lies near the bayou banks the slope back to the swamp is often quite marked. In a few places the surface is somewhat hummocky. In general the topography is nearly level.

About 50 per cent of the typical Miller clay is under cultivation or in pasture, and other areas were at one time farmed. Almost all the bottom-land farms extend back to the swamp, and all include more or less of this soil. On the north side of the river and around Rapides and Lamourie the proportion of the Miller clay under cultivation is larger than elsewhere.

The Miller clay is used for cotton, corn, oats, and alfalfa. Some sugar cane is grown, but much less than on the other Red River types. Oats and alfalfa are important crops, and the type is sometimes spoken of as "alfalfa land." Alfalfa is said to do fairly well on the lighter textured associated soils also, but Bermuda grass and other grasses make a strong growth, and the alfalfa does not hold up so well, so that most of it is grown on the Miller clay.

Where the land has been properly prepared relatively little cultivation is needed to keep it clean of grass. If plowed when too wet, the soil puddles and bakes so that clods are formed with subsequent cultivation, but at certain stages of moisture content it may be plowed with comparative ease, and on drying it crumbles into a very

satisfactory tilth. As light teams and implements are often used, the cultivation is frequently shallow and inefficient.

Another characteristic of this soil is its tendency to crack on drying. The cracks may become one-half inch or more in width and of considerable depth on the heaviest clay in seasons of drought. These cracks very materially increase evaporation and drying out of the subsoil just when water is most needed, and also tear and expose the plant roots. Since a dust mulch is difficult to maintain on a soil of this kind, cultivation only partially checks the drying out of the soil, and consequently all crops suffer almost as much from lack of moisture as on the sandy soils, where capillary movement of water is rapid but where conditions are favorable for maintaining a mulch in dry weather. This soil dries out rapidly in the spring, once the surface water is removed, since evaporation from the surface takes place rapidly.

On account of the difficulties of tillage, this soil is used to a large extent as hay land and pasture. White clover thrives, as do some other varieties of clover, while Bermuda and other grasses, coming in rather slowly, aid in making a sod which will carry a large number of stock from March to December, although a deficiency of pasturage due to drought may occur in July and August. It is customary to pasture stock the entire year, but some hay or other supplementary feed is generally necessary in the winter for best results. As this type where cultivated generally adjoins large areas of swamp land which furnish good pasturage, stock raising is more extensively developed than on the other Red River bottom types. Dairying could probably be carried on with profit.

On the north side of the river and around Rapides the growing of alfalfa on this type has assumed considerable importance. The crop is seeded between September and November following cowpeas, after the ground has been thoroughly prepared. The estimated cost of seeding is $10 per acre. Five or six cuttings are generally obtained each year, giving a total yield of about 4 tons per acre. The price varies from about $12 to $30 a ton, averaging about $14. A stand lasts about 4 or 5 years, or longer if not damaged by water. Some alfalfa is grown in the southern part and in other sections of the Red River bottoms.

Cotton yields one-half to 1 bale and corn about 25 bushels per acre. Yields are slightly heavier than on the lighter Miller soils. Cotton followed by corn with cowpeas is the usual crop rotation on this type, except where oats and alfalfa are grown.

The selling value of the Miller clay is somewhat lower than that of the other Miller soils, mainly because it is harder to work, less well drained, and generally more isolated from public roads. The

price ranges from $25 to $50 an acre, with higher values in some well-improved and well-drained tracts.

Tractors could probably be used to advantage on this type on the large farms, as with a tractor a large area could be given much more thorough tillage while in the optimum moisture content than is possible with mules and light implements.

Miller clay, swamp phase.—The swamp phase of the Miller clay differs from the typical only in that the color is somewhat darker and the texture somewhat heavier. The separation is based on the difference in drainage. The swamp phase is at present uncleared and lies generally lower than the main type, and is subject to longer periods of overflow. Practically all the surface drainage of the bottom land is directly into the flat, swamp areas. The drainage systems are tortuous and not well developed, so that the water is removed very slowly, and the land is seldom dry enough for cultivation. Some comparatively well drained areas are included with this phase, but they are isolated and at present of little value.

This phase occurs in large tracts along the foot of the northern and most of the southern bluff, in the center of the island formed by Bayou Rapides and the river, between Bayou Boeuf and Bayou Robert on the one side and the river on the other, also between Bayou Boeuf and Bayou Cocodrie. The phase is used for pasture during a part of the year. It is forested with honey locust, hackberry, swamp maple, oak, cottonwood, and other trees, with some cypress in the lower areas and frequently a rank growth of palmetto, often 6 or 8 feet in height. Reed cane and smilax are also common.

A large proportion of this phase could be made cultivable by the construction of canals and ditches to carry off the surface water, with floodgates to hold back the river water in times of flood. South of Alexandria several large ditches have been dug by the parish, and all but a few low areas probably will be drained.

SWAMP.

Swamp comprises areas that are covered with water or are in a very soggy or marshy condition during most of the year. It includes the areas locally known as "cypress brakes" and "flag lakes." The soil consists of peaty material mixed with alluvium. Along Cocodrie Lake much of it consists of grayish to light-brownish silt loam to silty clay loam, overlying yellowish peaty material which in turn is underlain by light-gray to bluish-gray silty clay.

Swamp occurs along the foot of the bluffs and in strips extending inland. Occasional areas of open water occur, but these are generally covered with rushes or flags. There is a large area along Cocodrie, Cotile, and Castor Lakes. The typical growth consists of

cypress and other water-loving trees, such as tupelo and swamp maple.

The type is nonagricultural. It would be difficult to drain this land, as it lies only slightly above the normal level of the streams.

SUMMARY.

Rapides Parish lies in central Louisiana. It comprises an area of 1,353 square miles, or 865,920 acres. The uplands, which constitute about 60 per cent of the total area of the parish, are largely undulating to gently rolling, but there are extensive nearly level areas and some that are quite rolling. The rolling lands are well drained, but in the level areas the drainage is imperfect. The broad bottoms of the Red River and the bottoms of the other streams are mainly level and subject to overflow, except those along the Red River bottoms, which are largely protected by levees. There are scattered areas of nearly level second-bottom land, occurring chiefly in the western part of the parish.

The most important upland soils are the Susquehanna, Ruston, and Caddo series, with considerable areas of Orangeburg and Lufkin soils. The Susquehanna series includes grayish surface soils overlying mottled, stiff clay subsoils. The very fine sandy loam is one of the most extensive soils in the parish. The Susquehanna silt loam also is mapped. The Ruston and Orangeburg series have grayish surface soils and light-red to deep-red, friable sandy clay subsoils. They are well drained. The Ruston series is represented by two types, the fine sandy loam and very fine sandy loam, and the Orangeburg by one type, the fine sandy loam. The Caddo soils are grayish at the surface, with yellowish subsoils which are mottled and rather compact in the lower part. The Caddo very fine sandy loam and silt loam are encountered in this parish. Their drainage is imperfect. Some of the very fine sandy loam is cultivated, but relatively less than of the Ruston and Orangeburg soils, which are the best and most extensively cultivated upland soils in the parish. Little of the Caddo silt loam is cultivated; it has poorer drainage than the very fine sandy loam type. The Lufkin silt loam is grayish in both surface soil and subsoil, and usually contains considerable small concretions. It is nearly level and represents the most poorly drained soil of the uplands. It is not cultivated.

Probably less than 25 per cent of the upland is in cultivation. Practically all the upland originally supported a heavy growth of valuable longleaf pine, and lumbering has been a leading industry for a considerable period. At the present time large cut-over areas are available for farming and pasture land. It is necessary to re-

move the stumps, however, in order to farm the land to the best advantage, although their presence does not prevent the use of the land for such crops as cotton and corn. The soil is generally well suited to such pasturage and hay crops as Bermuda grass and lespedeza, and many forage crops succeed, so that the opportunities for raising beef cattle and hogs appear to be very good.

The principal crops now grown on the uplands are cotton as the money crop and corn for use on the farm. Most farmers grow small patches of sugar cane for sirup, chiefly for home use. Oats, cowpeas, sweet potatoes, and velvet beans are among the minor crops, grown mainly for use on the farm. There are a few peach and pecan trees, and in the vicinity of Libuse some strawberries are grown for market.

A good many farmers raise some beef cattle, chiefly by pasturing them on the open range, including the stream bottoms. Hogs also are raised on the open range and some are sold.

The stream bottoms, aside from the Red River bottoms, are largely occupied by the Ochlockonee silt loam, which has a brownish surface soil with a lighter colored to somewhat mottled subsoil. Most of this bottom land is still forested, very little of it, except along some of the smaller streams, being farmed. Cotton and corn do well when not overflowed or when the cotton is not late and damaged by the boll weevil.

Beef cattle and hogs graze on the native grass in the bottoms, but this land is not used nearly to its capacity, even in its present condition, for cultivated crops or for supplying pasturage. Probably most of it could be used to advantage as hay and pasture land, without extensive drainage operations, as Bermuda grass and lespedeza thrive, and withstand ordinary overflows.

In the Red River bottoms the greater part of the land is cultivated and intensive methods of farming are employed. Sugar cane is an important crop grown for the manufacture of sugar and molasses, and some alfalfa is grown. The principal soils are the chocolate-red clay, silt loam, and very fine sandy loam of the Miller series. Much of the clay occurs in low situations of imperfect drainage, and is not farmed. The greater part of the other soils, however, is in cultivation, being used for cotton, corn, sugar cane, alfalfa, and pasturage. Some hogs and beef cattle are raised, and some market-garden and truck crops, including sweet and Irish potatoes, are produced. Deep breaking of the land with 2-horse plows or disks is practiced by many farmers, and rotations, frequently including cowpeas, are practiced. The cultivation is done with shallow-running plows. The swampy Miller clay land, if provided with better drainage, would add a large area of good land in this section of the county.

In the uplands cotton yields about one-fourth to one-third bale per acre. In the Red River bottoms the yield is one-half to three-fourths bale per acre. Corn and oat yields are light in the uplands, but fair to good in the bottoms. Sugar cane yields well on the better bottom lands.

Unimproved or cut-over upland can be bought for about $5 an acre. Improved land of the better soils is valued at about $8 to $25 an acre. In the Red River bottoms the price of land is much higher, ranging from about $40 to $100 an acre. The bottom land along the other streams can be bought for $8 to $25 an acre.

[PUBLIC RESOLUTION—No. 9.]

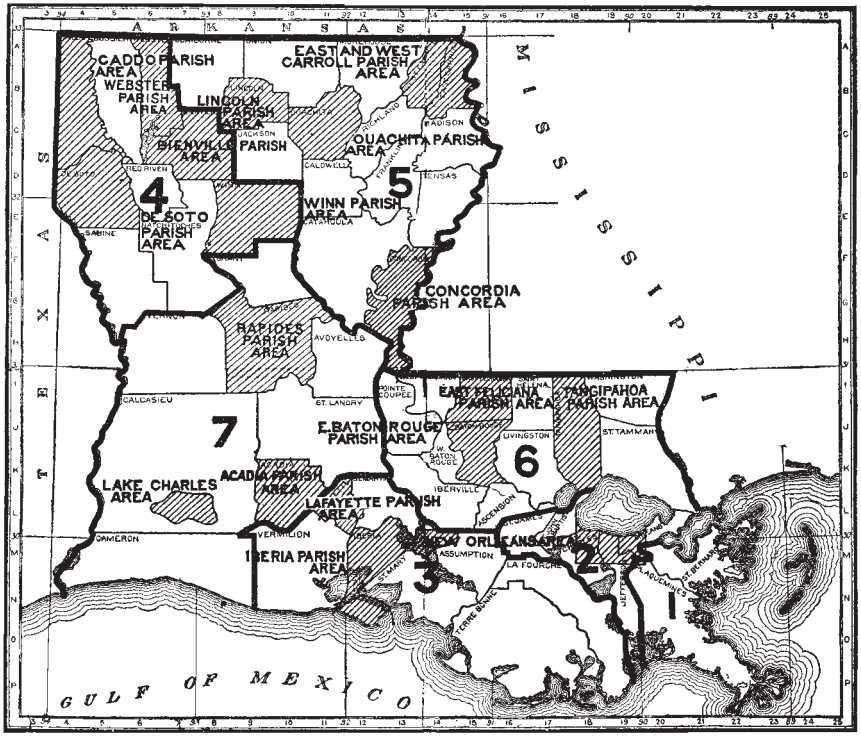
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]



Areas surveyed in Louisiana.

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U.S. DEPT. OF AGRICULTURE
BUREAU OF SOILS
MILTON WHITNEY, CHIEF
CURTIS F. MARBUT, IN CHARGE SOIL SURVEY

SOIL MAP

LOUISIANA
RAPIDES PARISH SHEET

R. 6 W. R. 5 W. R. 4 W. R. 3 W. R. 2 W. R. 1 W. R. 1 E. R. 2 E. R. 3 E. R. 4 E.

T. 5 N. T. 4 N. T. 3 N. T. 2 N. T. 1 N. T. 1 S. T. 2 S.

A B C D

LEGEND

Huston fine sandy loam — H
Bienville loamy sand — B
Miller very fine sand — M
Light phase — R
Huston very fine sandy loam — Hf
Miller very fine sandy loam — Mf
Caddo very fine sandy loam — Cv
Miller silt loam — Ms
Caddo silt loam — Cs
Miller clay — Mc
Susquehanna very fine sandy loam — Sv
Swamp phase — Mc
Susquehanna silt loam — Si
Leaf very fine sandy loam — Lv
Better drained phase — Si
Leaf silt loam — Ls
Orthiedocrere silty clay loam — Oc
Orangeburg fine sandy loam — Of
Light colored phase — Oc
Luffkin silt loam — Li
Orthiedocrere silty clay loam — Oc
Monkeegee very fine sandy loam — Mf
Crowley silt loam — Cl
Chattahoochee very fine sandy loam — Cf
Swamp — S

CONVENTIONAL SIGNS

CULTURE
(Printed in black)

City or Village, Roads, Buildings, Wagon or Ferry, Bridges, Railroads, Levees, Lighthouses, Piers

Cemetery, Church, School or Church, Cemeteries

Mines or Quarry, Mine Dump, Shaft, Tunnel

Sandy and Gravelly areas

Scale Land Surface

Boundary lines

U.S. township and section lines

RELIEF
(Printed in brown or black)

Contours, Depression contours

Prominent Hills, Mountain Peaks

Sand Wash and Sand Dunes

Shore and Low water line, Sandbar

DRAINAGE
(Printed in blue)

Streams

Lakes, Ponds, Intermittent Lakes

Intermittent Streams

Swamp, Salt marshes

Submerged marsh, Tidal flats

The above signs are to conform as far as practicable to those used on the standard topographic sheets of the United States Geological Survey.

Cudahoula Lake

Hugh H. Bennett, Inspector, Southern Division.
Soils surveyed by E. H. Smiley, in charge, Roden T. Allen, J. B. R. Dickey, W. A. Rocke, R. C. Jurney, R. H. Burn, M. Earl Gent, and Hugh H. Bennett.

Scale 1 inch = 1 mile

Field Operations
Bureau of Soils
1916